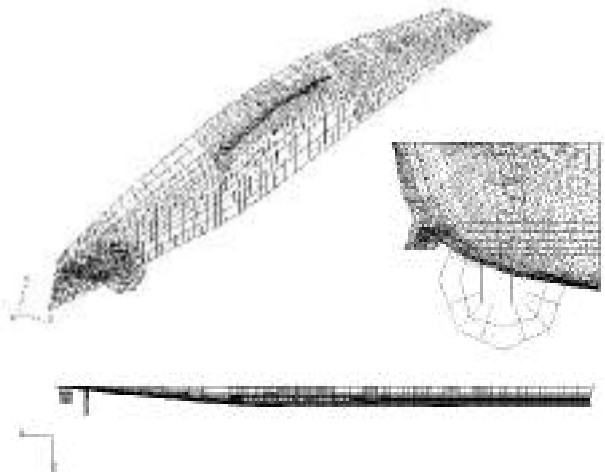
Science and Technology Success Stories

Computational Modeling of ICCP Systems

The Naval Research Laboratory (NRL), the Navy's corporate laboratory, has developed the expertise to use boundary element techniques to design shipboard impressed current cathodic protection (ICCP) systems. Corrosion is a major concern for Navy ships and other structures in a marine environment. ICCP systems are an established methodology for limiting corrosion related damage. Current accepted practices for design of ICCP systems are design by experience and use of scale model experimental procedures. Use of a computational based method of ICCP design would improve system effectiveness and efficiency. Currently work completed has examined U S Navy hull forms for CG, CVN and FFG class ships.

The process developed uses commercial off the shelf boundary element software and has been validated by comparison with scale model experimental data. In addition to exploration of basic design issues, such as anode number and placement, the process has been used to determine system performance sensitivity to environmental factors such as seawater conductivity ranges and levels of paint deterioration.



Mesh of below waterline portion of CG hull

Computational Modeling of ICCP Systems

Military Impact

- **Ability to design more effective and efficient ICCP systems**
- **Ability to quickly evaluate changes in system configurations**
- **Ability to assess system capability taking into account:**
  - **Changes in system configuration**
  - **Paint or coating deterioration**
  - **Changes in deployment location and environmental conditions**
- **Ability to provide information for condition based maintenance**
- **Transition design and evaluation methodologies to other shipboard systems**
- **Increased ship availability**
- **Decrease corrosion related damage**

Potential Civilian Spin-offs

- **Provide insight into electrochemical corrosion response**
- **Design and development of ICCP systems for commercial shipping and other marine structures**
- **Transition design methodologies and knowledge to non-marine corrosion problem areas, i.e. atmospheric corrosion and acid rain regions**

Point of Contact

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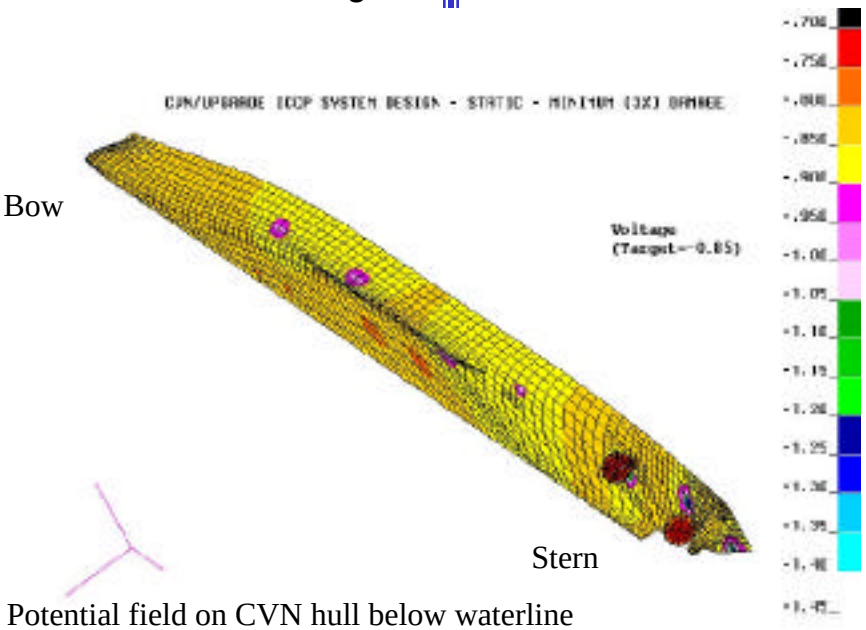

Potential field on CVN hull below waterline